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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/502,104	09/19/2005	Dror Shemesh	6317P076	3403

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EXAMINER	
JOHNSTON, PHILLIP A	
ART UNIT	**PAPER NUMBER**
2881	

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06/02/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/502,104	SHEMESH ET AL.	
	Examiner	Art Unit	
	PHILLIP A. JOHNSTON	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 March 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5,9-15,17 and 19-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,9-15,17 and 19-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 September 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5-26-2010*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

1. This Office Action is submitted in response to the amendment filed 3-29-2010, wherein claims 1, 5 and 13 have been amended. Claims 1-5, 9-15, 17 and 19-21 are now pending.

Response to Arguments

2. Applicant's arguments filed 3-29-2010 have been fully considered but they are not persuasive.

3. The Applicant argues at page 6 of the remarks that, Claim 1, as amended, recites inter alia controlling a division of the low-energy and high-energy electrons between the multiple in-lens detectors and the inner lens detector assembly by modifying the substantial electrostatic field and modifying a distance between the column and the object. At least this feature of claim 1 is not taught or suggested by Todokoro I. For example, even if Todokoro I were to teach controlling a division of electrons between a lower detector assembly (including secondary electron multipliers 14 and 41) and an upper detector assembly (including secondary electron multipliers 65 and 70) by varying the acceleration voltage (see, e.g., Todokoro I, 15:17-55), Todokoro I is silent as to controlling same by modifying a distance between the column and the object. Therefore, claim 1 and its dependent claims are patentable over Todokoro I. Because claim 13 recites features similar to those recited in claim 1, claim 13 and its dependent claims are likewise patentable over Todokoro I.

The examiner disagrees.

Todokoro (720) teaches directing low and high energy electrons to multiple detectors by modifying the electrostatic field to which the electrons are exposed. For example, at Col. 15, line

17-55, Todokoro (720) discloses detecting secondary electrons with detector 14 and detecting reflected electrons with a different set of detectors 41, 65 when a high acceleration voltage is applied to the electron emitter and a low voltage is applied to the sample. On the other hand, both secondary and reflected electrons are detected together by detectors 14, 41, 65 when a low acceleration voltage is applied to the emitter and a high voltage is applied to the sample.

The reference above would suggest to one of ordinary skill in the art that Todokoro (720) teaches controlling the division of low and high energy electrons between multiple detectors by modifying the substantial electrostatic field.

Todokoro (720) also teaches maintaining control of secondary and reflected electron detection efficiency by adjusting an applied electric field when the sample is tilted by the sample stage. See Col. 11, line 65-67 and Col. 12, line 1-9.

The reference above would suggest to one of ordinary skill in the art that when the sample is tilted, the distance between the column and the sample is inherently modified and as such during the distance modification that results from tilting the sample, Todokoro (720) controls electron detection by selected detectors by adjusting the electric field.

Therefore in light of the above, the examiner concludes that Todokoro (720) teaches the newly amended limitations to claims 1 and 13.

4. The rejection of claims 1-5, 9-15, 17 and 19-21 are maintained.

5. All claims stand finally rejected.

Claims Rejection - 35 U.S. C. 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-3, 5, 9, 13-15, 17, 19 and 20 are rejected under 35 U.S.C. 102 (b) as being anticipated by Todokoro, USPN 5,939,720.

5. Regarding claim 13, Todokoro discloses a scanning electron microscope shown in Figure 5 below including;

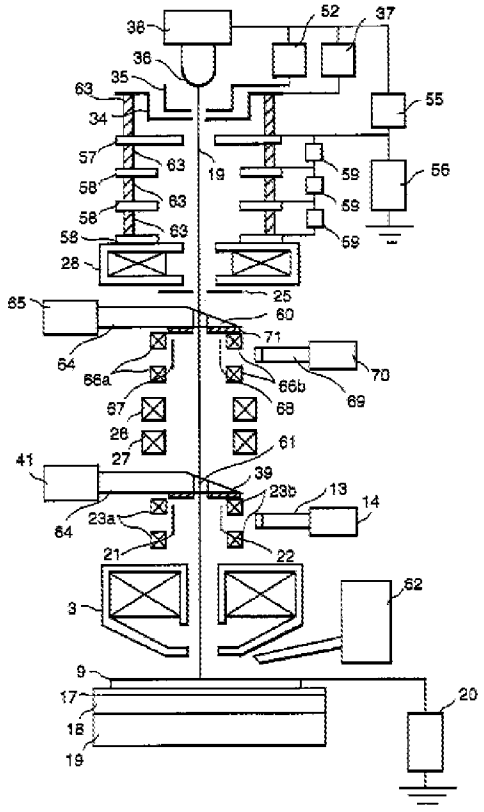
(a) Primary electron beam 19 and a column through which the beam propagates along an axis to sample 9. See Col. 14, line 41-64,

(b) Impinging the primary beam on sample 9 to generate low energy secondary electrons and high energy reflected electrons which are extracted (directed) into an aperture of the objective lens by the electric field applied across the objective lens 3. Col. 15, line 17-25,

(c) In-lens detector assembly 39, 14 detects low energy secondary electrons and high energy reflected electrons that have been scattered (the first portion) by the lens action of the objective lens causing a reduced energy,

(d) Inner-lens assembly 71, 70 detects the high energy reflected electrons not scattered (the second portion) by the lens action of the objective lens and passing through the opening 61, such that the reflected electrons are coincident with the beam (optical) axis.

FIG. 12



Regarding the newly amended limitation; controlling division of low and high energy electrons between multiple detectors by modifying the substantial electric field, Todokoro (720) discloses detecting secondary electrons with detector 14 and detecting reflected electrons with detectors 41 and 65 when a high acceleration voltage is applied to the electron emitter and a low voltage is applied to the sample, whereas both secondary and reflected electrons are detected together by detectors 14, 41 and 65 when a low acceleration voltage is applied to the emitter and a high voltage is applied to the sample. See Col. 15, line 17-55.

Regarding the newly amended limitation; controlling division of low and high energy electrons between multiple detectors by modifying the distance between the column and the object, Todokoro (720) teaches that, when the sample is tilted, the distance between the column

and the sample is inherently modified and during sample tilting (distance modification), control of electron detection with a selected detector is maintained at high efficiency by controlling the electric field.

6. Regarding claim 1, Todokoro discloses the apparatus used in this method claim, as pointed out above regarding claim 13 including; directing and impinging the primary electron beam 19 on sample 9 to generate low energy secondary electrons and high energy reflected electrons which are directed by an applied electric field to separate in-lens and inner lens detectors and includes control of detection when the sample is tilted.

7. Regarding claims 2, 3, 14 and 15, Todokoro discloses at Col. 14, line 41-67 applying a negative superimposed voltage of -4KV between ground and the sample 9 (a first low voltage potential difference at the first portion of the column located nearest the sample), and applying an acceleration voltage of 5kV between ground and electrode 57 (a second higher voltage potential difference between a second portion of the column farthest from the sample). See Figure 12 above.

8. Regarding claims 5 and 17, Todokoro teaches the use of different detector collection zones. See Col. 13, line 37-54.

9. Regarding claims 9 and 19, Todokoro teaches the inspected object is positioned within the substantial electrostatic lens field. Col. 6, line 3-9.

10. Regarding claim 20, Todokoro (720) teaches using a stage capable of tilting the sample, while efficiently detecting secondary and reflected electrons from the sample surface at Col. 11, line 64-67 and Col. 12, line 1-9.

Claims Rejection – 35 U.S.C. 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 5,939,720 to Todokoro, in view of Todokoro, USPN. 6,084,238.

Regarding claims 10 and 11, Todokoro (720) teaches the apparatus used in these method claims as described above regarding claim 1.

Todokoro (720) teaches using a stage capable of tilting the sample, while efficiently detecting secondary and reflected electrons from the sample surface at Col. 11, line 64-67 and Col. 12, line 1-9.

Todokoro (720) fails to teach determining a measurement angle that ranges between acute angles and obtuse angles.

Todokoro (238) discloses using a sample stage having an inclining mechanism for tilting the sample and measuring the inclination in advance at Col. 14, line 5-48.

In addition, one of ordinary skill in the art recognizes that a sample stage having the inclining mechanism taught in Todokoro (238) includes the ability to adjust the angle of incidence between acute and obtuse angles, which is the predictable use of such a stage mechanism according to its established function.

Todokoro (238) modifies Todokoro (720) to provide a sample tilting mechanism for varying the angle of incidence of the beam on a sample.

Therefore it would have been obvious to one of ordinary skill in the art that Todokoro (720) would use the tilting mechanism of Todokoro (238) to enable a sample to be tilted to change the observing position on the sample without adversely effecting secondary electron detection efficiency thereby providing a scanning image that shows the shape and composition of the surface of the sample with high resolution. Col. 1, line 9-17 and Col. 14, line 40-48.

13. Claims 4, 12 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 5,939,720 to Todokoro, in view of Todokoro, USPN. 6,635,873.

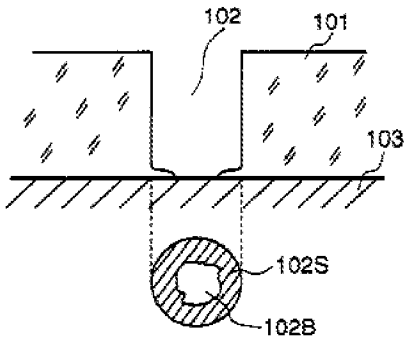
14. Regarding claims 4, 12, and 21, Todokoro (720) discloses the apparatus and method for detecting high and low energy electrons generated by exposure of a sample to an incident electron beam as described above regarding claims 1 and 13.

Todokoro (720) also teaches imaging samples to inspect shapes on a silicone wafer that is processed in the semiconductor industry at Col. 1, line 41-56.

Todokoro (720) fails to disclose processing the received detection signals to provide an indication about a defect or a process variation; and wherein detected electrons include electrons from a lower portion of a high aspect ratio hole.

Todokoro (873) teaches using a scanning electron microscope to observe residue at the bottom of a high aspect ratio contact hole. See Figure 14b below; Col. 2, line 8-18; and Col. 5, line 39-49.

FIG.14B



Todokoro (873) modifies Todokoro (720) to provide a scanning electron microscope to observe the shape of the bottom of a contact hole in a wafer processed in the semiconductor industry.

Therefore it would have been obvious to one of ordinary skill in the art that Todokoro (720) would use the contact hole imaging technique of Todokoro (873) to provide a scanning electron microscope for observing the bottom of a contact hole formed on an observation sample such as an IC. Col. 1, line 63-67 and Col. 2, line 1-18.

Conclusion

6. The Amendment filed on 3-29-2010 has been considered but is ineffective to overcome the references cited in the Office Action mailed 12-28-2009.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the

THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

7. Any inquiry concerning this communication or earlier communications should be directed to Phillip Johnston whose telephone number is (571) 272-2475. The examiner can normally be reached Monday-Friday from 7:30 am to 4:30 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiners supervisor Robert Kim can be reached at (571) 272-2293. The fax phone number for the organization where the application or proceeding is assigned is 571 273 8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PJ
May 26, 2010

/ROBERT KIM/

Supervisory Patent Examiner, Art Unit 2881